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(54) Instantaneous water heater with presets

(57) An instantaneous water heater, such as a shower heater, has an inlet (11) and an outlet (12), heating means (15) to heat the water as it flows from the inlet (11) to the outlet (12), a microprocessor control means (16) operable to adjust the level of heat dissipated to the flowing water by the heating means (15) and hence to change the temperature of the outflowing water, and one or more memories (M1 to M4) which are individually programmable by users of the heater to signal the control means (16) to cause the control means to adjust the level of heat dissipation to the flowing water to achieve a predetermined (preset) water temperature at the outlet (12) when a control (C1 to C4) is subsequently selected by a user.

Thus each member of a family can programme one memory of the heater for the delivery of water at a predetermined temperature.

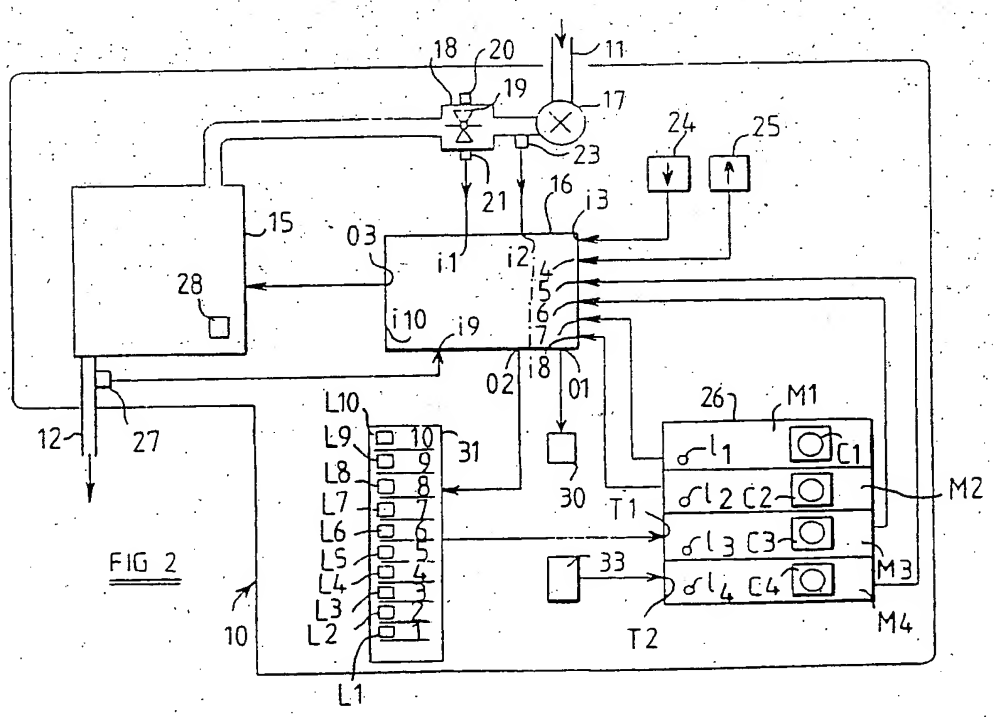

FIG 2

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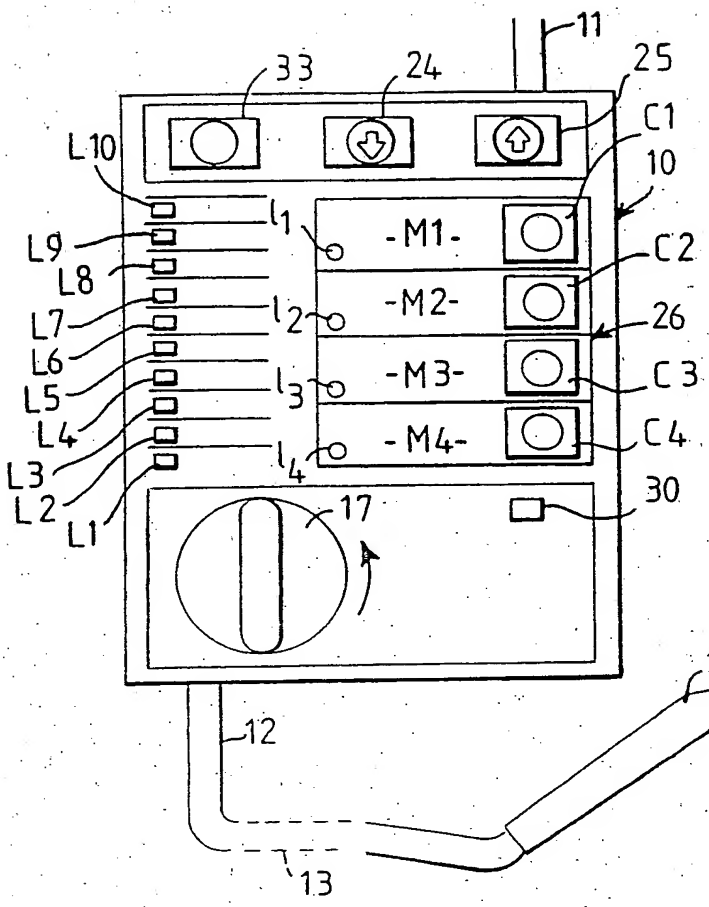

FIG 1

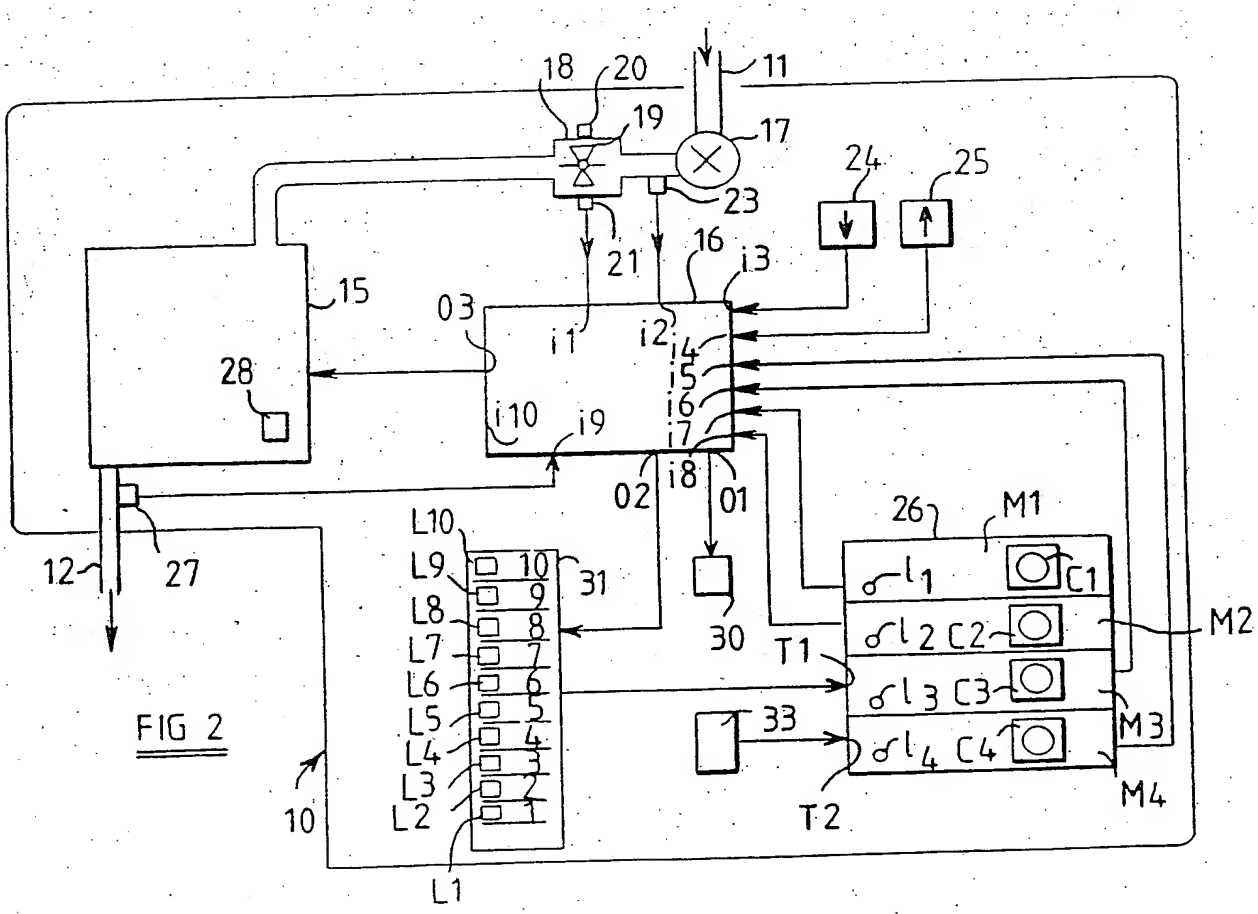

FIG 2

Title: "Instantaneous water heater"

Description of Invention

This invention relates to an instantaneous water heater, that is a water heater having an inlet and an outlet and heating means to heat the water as it flows from the inlet to the outlet.

Such a heater is disclosed in prior patent application which is published under No. 2148467. In this previous application, an instantaneous water heater is described in which upon a user selecting a desired flow rate of water through the heater, the heater in response automatically adjusts the heat output of the heating means to a standard temperature of 105°F (40.5°C.). A user can increase or decrease this temperature to a desired temperature by operating further temperature controls.

An object of the present invention is to provide a new or improved instantaneous water heater.

According to the invention we provide an instantaneous water heater comprising an inlet and an outlet, heating means to heat the water as it flows from the inlet to the outlet, control means operable to adjust the level of heat dissipated to the flowing water by the heating means and hence to change the temperature of the outflowing water, a memory which is programmable by a user of the heater to signal the control means to cause the control means to adjust the level of heat dissipation to the flowing water to achieve a predetermined water temperature at the outlet when a control is subsequently selected by a user.

Thus the control means automatically adjusts the temperature of the outflowing water to suit an individual user, without the user having to manually adjust the temperature of the water each time he uses the water heater.

Preferably the heater has a plurality of memories each individually programmable so that different users can each programme one of the memories so that a desired temperature of the outflowing water can be achieved for each individual user by the user operating a control.

For example, where the instantaneous water heater is a shower heater, different members of a family may each prefer to shower in water of slightly different temperatures. In an arrangement having a plurality of memories, each member can programme one memory of the heater so that upon operation of a control of the appropriate memory, the heater will deliver water of the preferred temperature for that user.

The heater may incorporate a water flow control which a user can manually adjust to achieve a desired water flow rate. The control means may sense the water flow rate to provide water at the outlet at a temperature predetermined by the or one of the memories which has been selected, irrespective of the water flow rate.

For example a water flow rate detector may be provided in the water flow to sense the water flow rate and provide an input to the control means to which the control means responds.

In addition, or alternatively, the temperature of the inflowing water may be sensed by sensor means which also provides an input to the control means to which the control means may respond.

The heater may include an output temperature indicator to facilitate programming of the memory or memories, and may include conventional manual temperature control means to enable a user to increase or decrease the temperature of the outflowing water, for example to enable the memory or memories to be programmed.

The temperature indicator may comprise a series of indicator lights in an ascending scale, an indicator light or a plurality of the lights being lit to indicate the water outlet temperature. The lights may comprise light emitting diodes or other solid state devices, or neon or filament lamps as required.

As mentioned above, the invention is particularly applicable to a shower heater although could otherwise be applied as required. Where the invention is applied to a shower heater, the outlet may be connected to a shower spray head and the inlet to a water source.

The invention will now be described with the aid of the accompanying drawings in which:

FIGURE 1 is a front elevation of a shower heater according to the invention.

FIGURE 2 is a diagrammatic illustration of the workings of the shower heater of Figure 1.

Referring to the drawings, an instantaneous water heater for a domestic shower is shown at 10. The heater 10 comprises a water inlet 11 which may be connected to a mains water supply or header tank water supply, and a water outlet 12 which is connected by a flexible hose 13 to a shower spray head 14.

An electrical heating means 15 is provided to heat water as it flows from the inlet 11 to the outlet 12 and may comprise for example a canister into which a plurality of heating elements extend as described in previous application GB 2148467. In this case, different heating elements may be switched on and off in different combinations to achieve different levels of heat dissipation to the flowing water for example to vary the temperature of the outflowing water or to maintain the temperature constant for different flow rates. Alternatively, or in addition, the heating means may comprise a single element, the heat output of which may be varied for example by burst firing, or any other type of heating means which can be operated to provide varying levels of heat dissipation can be used.

The heating means 15 is controlled by a control means which comprises a microprocessor 16 to which various inputs are provided, and the control means is adapted to control the heating means 15 to provide outflowing water at a constant temperature regardless of flow rate of water through the heater 10 or the temperature of the inflowing water, which flow rate can be adjusted by a user operating a flow rate control indicated at 17.

The microprocessor 16 has the following inputs.

The flow rate of water selected by operating control 17 is sensed by a water flow rate detector 18 of any known type, although in this example, the flow rate detector comprises a turbine 19 which rotates in response to the flow rate, and the rate of rotation of turbine 19 is sensed by an electronic means comprising a light source 20 and photo transistor 21. Thus the photo transistor 21 provides a pulsed input to an input terminal 11 of the microprocessor 16, which input depends upon the flow rate of the inflowing water.

Any alternative flow rate detector could be provided e.g. the turbine 19 could carry a magnet which, as it rotates, opens or closes a reed switch to provide a pulsed input to the microprocessor 16 depending on the water flow rate.

Adjacent the inlet 11, a temperature sensor 23 such as a thermistor, thermocouple, or other electronic solid state temperature sensing device is

provided, to provide an input to terminal i2 of the microprocessor 16 depending on the temperature of the inflowing water.

A first temperature control 24 may be operated by a user of the heater to cause the control means to decrease the level of heat dissipated by heating means 15, which control 24 provides an input to a terminal i3 of microprocessor 16 when the control 24 is pressed by a user. On releasing the control 24, the input to terminal i3 is preferably stopped.

Similarly, a temperature control 25 provides an input to terminal i4 of the microprocessor 16, when depressed by a user to cause an increase in the temperature of the outflowing water.

Four further input terminals i5 to i8 are connected to a memory means 26, the operation of which will be described hereinafter.

The outlet 12 has a further temperature sensor 27 which again may be a thermistor, thermocouple, or other electronic sensor device, which sensor 27 is included to provide an input to terminal i9 of the microprocessor 16 whereby a feed back signal to the microprocessor 16 enables an accurate control of the outlet temperature to be achieved, at least immediately after the heater is switched on, for calibration purposes.

A further temperature sensor 28 which is preferably a mechanical sensor, although may be an electronic sensor, is provided, the sensor 28 being in intimate contact with the heating means 15 and comprising a safety device in the event that the temperature of the canister or other heating means 15 exceeds a safe temperature, for example if the heater 10 is actuated with no water being able to flow. The sensor 28 is arranged to operate independently of the microprocessor 16and is for example connected in series with the live supply to the heater 10 to cut off the power supply to the entire heater should a dangerously high temperature be sensed.

The microprocessor 16 has the following outputs, namely, an output O1 to an indicator light 30 to indicate to a user that the heater 10 is not capable of delivering water at a selected output temperature, for a selected flow rate chosen by operation of valve 17. Thus the indicator light 30 instructs a user to decrease the flow rate of water through the heater 17, although in a modified arrangement means may be provided to instruct a user to decrease the chosen temperature of the outflowing water instead of or as an alternative to reducing the flow rate.

A second output terminal O2 is connected to a temperature indicating means 31 which in the present example comprises ten indicator lights L1 t

L10 which may be light emitting diodes. Light L1 is lit when the outlet temperature is at the minimum value and light L10 is lit when the output temperature is at a maximum value, and the other lights L2 to L9 are illuminated for appropriate temperatures inbetween the maximum and minimum levels.

A further output terminal O3 is connected to the heating means 15, although an output terminal for each of the heating elements where a plurality of heating elements are provided in heating means 15, may be required.

The heater 10 is adapted to operate independently of the memory means 26 as follows.

When control 17 is operated to allow water to flow through the heater 10, an input is provided to the microprocessor 16 from the flow rate detector 18 and the water inlet temperature sensor 23 and in response, the microprocessor 16 will provide a signal to the heating means 15 to heat the flowing water to a predetermined temperature which is preferably 105°F (40.5°C.). The temperature of the outflowing water may be monitored by the control means by virtue of the feed back signal from the temperature sensor 27 at least during an initial calibration period. Thus as the water reaches the desired temperature, the heating means 15 is adjusted to deliver heat at a steady heating state for the particular water flow rate selected so that a constant temperature water supply at the desired temperature is achieved at outlet 12.

In the event of a change in flow rate, for example by a user operating control 17, the input to the control means 16 from the flow rate detector 18 will change and the microprocessor 16 will respond by adjusting the level of heat dissipation of the heating means 15 in order to maintain the water temperature at the outlet 12 constant.

As mentioned above, if a user selects too great a flow rate for an output temperature of 105°F (40.5°C) to be achieved, the control means will signal indicator 30 to instruct the user to reduce the flow rate.

If a user wishes to increase the temperature of the outflowing water (and indicator light 30 is not illuminated), control 25 may be operated, and conversly if a user wishes to decrease the temperature of the outflowing water, control 24 may be operated.

The manner of operation of the heater 10 independently of the memory means 26 is described in detail in published Application GB 2148467 the

subject matter of which is hereby incorporated by reference, into this specification.

In accordance with the present invention, the memory means 26 is operable to enable a user to achieve a predetermined water outlet temperature without having to adjust the control 24 or control 25 on each occasion the user uses the shower heater 10.

In the present example, the memory means has four memories M1 to M4 which are connected respectively to terminals i5 to i8 of microprocessor 16.

The memory means 26 has two inputs, first an input T1 from the indicator means 31, and secondly, an input T2 from a "mode" control 33 which inputs are used for programming the memories M1 to M4.

Each memory has a control C1 to C4 respectively and an indicator light I_1 to I_4 to indicate to a user which memory M1 to M4 has been selected and is in operation.

Each memory M1 to M4 is programmed in a similar fashion and thus programming of memory M1 only will be described.

First, a user actuates the shower heater by operating control 17 as previously described. In the example described, the indicator light L5 will be illuminated when the output temperature reaches 105°F (40.5°C). Whilst the heater reaches a steady state, the indicator light L5 may flash.

The user then operates the control 24 and/or 25 to achieve a desired water outlet temperature, which will be indicated by an appropriate light L1 to L10 being illuminated. When the water is outflowing at the desired temperature, the user operates first the mode control 33, followed by the memory control C1.

A different member of the household may programme one or other of the remaining memories M2 to M4 in a similar manner, with a different desired water outlet temperature.

Subsequently, when a user wishes to use the shower heater, after selecting a desired water flow rate by operating control 17, rather than having to operate the controls 24 and 25 to achieve the desired water outflow temperature, simply control C1,C2, C3 or C4 is operated on the memory means 26 to provide an input to the microprocessor 16 which will respond by causing the heating means 15 to dissipate heat at a level calculated to provide a water outlet temperature at the desired level, depending on the inputs from the water flow rate detector 18 and a temperature sensor 23. Fine control of the outlet temperature may be facilitated by virtue of the

feed back signal from the water outlet temperature 27, although preferably this is only used for calibration purposes as described in earlier Applicati n GB 2148467.

The memories M1 to M4 can be reprogrammed at any time, by adjusting controls 24 and 25 until water at a predetermined temperature is flowing from the outlet 12, and then pressing the mode control 33 followed by the appropriate memory control C1 to C4.

Various modifications may be made without departing from the scope of the invention. Particularly, as described, the memory means 26 has four individual memories, if desired, the memory means may only have one or less than, or more than four memories. The memories may be programmed in any desired way by a user of the heater as required.

It is not essential for a temperature indicator 31 to be provided, although this is preferred to give an indication to a user of the temperature of the water which is outflowing. The signal to terminal T1 of the memory means 26 could be obtained direct from the microprocessor 16 or even from one of the ensors 23,27.

As described, a user may select a flow rate of water by operation of control 17. If desired, the heater may only have a fixed flow rate, in which case an input from a flow rate detector such as detector 18 to the control means 16 may not be required.

Instead of push button individual controls 24 and 25 for providing inputs to the mincroprocessor 16 to adjust the level of heat dissipation by the heating means 15, any other control means for providing one or more inputs to the microprocessor 16 to adjust the heating level, may be provided.

It will be appreciated that the layout of the controls of the heater 10 as indicated in Figure 1, is only an example and that many alternative layouts are possible.

Although as described, the invention has been applied to a shower heater, the invention may be applied to any instantaneous water heater as required. Although as described, the heating means has been an electrical heating means, it will be appreciated that with a suitable control means, any other type of heating means, such as a gas heating means or the like, may be provided. In each case however, the heating means must be capable of varying the heat dissipated to the water flowing through the heater under the control of a control means.

The features disclosed in the foregoing description, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, or a class or group of substances or compositions, as appropriate, may, separately or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS:

1. An instantaneous water heater comprising an inlet and an outlet, heating means to heat the water as it flows from the inlet to the outlet, control means operable to adjust the level of heat dissipated to the flowing water by the heating means and hence to change the temperature of the outflowing water, a memory which is programmable by a user of the heater to signal the control means to cause the control means to adjust the level of heat dissipation to the flowing water to achieve a predetermined water temperature at the outlet when a control is subsequently selected by a user.

2. A heater according to Claim 1 wherein the heater has a plurality of memories each individually programmable so that different users can each programme one of the memories so that a desired temperature of the outflowing water can be achieved for each individual user by the user operating a control.

3. A heater according to Claim 1 or Claim 2 wherein the heater incorporates a water flow control which is manually adjustable by a user to achieve a desired water flow rate.

4. A heater according to Claim 3 wherein the control means may sense the water flow rate to provide water at the outlet at a temperature predetermined by the or one of the memories which has been selected, irrespective of the water flow rate.

5. A heater according to Claim 4 wherein a water flow rate detector is provided in the water flow to sense the water flow rate and provide an input to the control means to which the control means responds.

6. A heater according to Claim 4 or Claim 5 wherein the temperature of the inflowing water is sensed by sensor means which also provides an input to the control means to which the control means responds.

7. A heater according to any one of the preceding claims wherein the heater includes an output temperature indicator to facilitate programming of

the memory or memories.

8. A heater according to Claim 7 wherein the temperature indicator comprises a series of indicator lights in an ascending scale, an indicator light or a plurality of the lights being lit to indicate the water outlet temperature.

9. A heater according to Claim 8 wherein the lights comprise light emitting diodes or other solid state devices, or neon or filament lamps.

10. A heater according to any one of the preceding claims wherein the heater includes conventional manual temperature control means to enable a user to increase or decrease the temperature of the outflowing water.

11. A heater according to any one of the preceding claims wherein the heater is a shower heater the outlet being connected to a shower spray head and the inlet to a water source.

12. A heater substantially as herein described with reference to and as shown in the accompanying drawings.

13. Any novel feature or novel combination of features as herein defined and/or shown in the accompanying drawings.

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